

REMARKS

The subject matter of original claims 4 and 5 has been incorporated into claim 1 and claims 4 and 5 have therefore been canceled. These amendments meet the 35 USC 112 rejections with respect to the terms “optimum moisture”, “optimum level”, “near uniform size”, and “high temperature, short time treatment”. Reference to sorghum has been added to claim 1 to provide antecedent basis for claim 7.

So far as the term “pseudoelastic” is concerned, it is submitted that this term should be permitted to remain in the light of the applicants’ explanation of the use of the term in this art, which is as follows:

The term "pseudo-elasticity" is actually used with reference to the grain texture results due to the steaming of hydrated grains for 5 to 10 min. which imparts slightly elastic nature to the kernels. In general, decorticated finger millet does not exhibit any elastic property in normal conditions. However, tempering with water to raise its moisture content followed by steaming for 10 min. imparts elastic behavior in the grains. Just tempering, without steaming step, does not impart this property to the grains. Thus, steaming is a necessary step to impart this particular property in the grains. This elastic behavior remains till the moisture content of the millet drops below 35%. Thus, very mild mechanical impact to the grains does not result in reshaping them, but instead the grains retain back to their original size. This property of the decorticated millet has been termed as the pseudo-elasticity. Hence, the mechanical impact should be gentle enough to cause an optimum reshaping of 0.7 to 1 mm thickness and 1.5 to 1.66 mm diameter. This particular property of the decorticated grains facilitates to create internal fissures in the grain without visible cracks outside during mechanical impact. If at all the visible cracks are formed, the expansion ratio of the grains will be adversely affected.

The term "carbohydrate digestibility" refers to the digestible percentage of the carbohydrate content in the millet grain at the extent of gelatinization. Because of the high temperature short time treatment, starch is cooked, leading to a carbohydrate digestibility of over 90%.

Claim 12 has been amended to refer only to a crispy texture.

Claim 14 has been amended to clarify the intent.

It is therefore believed that all of the 35 USC 112 issues raised in the official action have been met.

Turning now to the issues raised under 35 USC 103, the present invention relates to equilibrating millet or sorghum grains to moisture content of 15-35% by adding water to the decorticated grains and tempering or resting them, loosening the intracellular intactness of the endosperm by mechanical means and then undergoing bumping/flattening. After this the millet or sorghum grains are subjected to high temperature short time treatment to prepare the expanded millet or sorghum. The novelty and inventive step of the present invention resides in the pre-processing of the millet or sorghum grains before subjecting them to high temperature short time treatment. The pre-processing ensures that the endosperm is softened, loosened and does not develop any visible cracks/fissures. The pre-processing also provides elastic texture in the millet or sorghum endosperm enabling the grain to withstand the physical impact. Therefore it is novel and inventive to provide a process for preparation of expanded grain with a cereal like millet or sorghum, which is otherwise not known to be used for such processing.

US 2289529 (Thompson et al.) provides a new cereal food in which the puffs are internal from cereals such as maize, wheat and the like (rice and rye are mentioned) in which there is a relatively even outer shell within which the puffing takes place. The product obtained has a case hardened outer surface which is smooth and relatively hard, being impervious to moisture in milk and cream so that the grains do not become rubber-like, sticky and gelatinous. Therefore, the purpose of this invention is to achieve a puffed cereal with an undisturbed outer surface of the grain, which is retained and strengthened with the puffing taking place internally. The present invention provides preparation of expanded millet or sorghums from decorticated finger millet or sorghum grains.

Finger millet differs from maize and wheat in its kernal structure and composition. The starch granules in millet are compactly packed which on partial boiling, for example as described in Thompson's process for maize and wheat) results in a hard and homogenous mass which remains on decortication. Puffing these decorticated millet grains does not result in a good expansion ratio. The process of the present invention on the other hand, wherein the millet or sorgurum has been decorticated results in uniform expansion of the entire endosperm in all directions while retaining the original shape. Thompson et al's teaching relates to grains where puffing can be effected within the outer shell of the grain and not to finger millet or sorghum which exhibits unique textural features.

Furthermore, Thompson et al describes process wherein the grain is washed after removal of the bran coat and then soaked in a solution containing sugar, salt and malt extract or other flavoring agents with the temperature of the solution ranging from 70°F to 190°F during soaking. The grains are then cooked in live steam and cooled and compressed. The grains are then dried at temperature ranging from 70°F to 150°F and further held at 70°F to 80°F for 6 hours to an indefinite period. The "grits" so obtained are further subjected to a temperature of from 500°F to 600°F in an oven. Thus the process taught in Thompson et al is highly energy intensive requiring elevated temperature at all the stages . The present invention provides preparation of expanded millet or sorghum wherein high temperature short time. treatment is given just once to the grains. Therefore the process of the present invention is easier and more economical. . .

The present invention teaches raising the moisture content of the grains to 35% (note: by soaking in excess water) without the aid of salt or sugar. In case of rice also it is well documented that sprinkling the grains with salt or sugar facilitates better expansion of the grains. In such cases, the resultant grains will possess either salty or sweet taste due to these agents, which play a detrimental role in the organoleptic characteristics of the product. The product produced by the present invention is bland in taste and therefore may be conveniently incorporated into a variety of food products or can be coated with any edible material.

Moreover, Thompson et al teaches a method to deform the grain with the aid of roller flaker

but, the end product does not resemble the shape of the control or raw grain. The present invention teaches a method to prepare the expanded product which resembles the shape of the original grain with puffed crispy texture. The deformation before puffing was done to rupture the endosperm integrity to facilitate the expansion of the kernel without the aid of any chemical agents. Therefore, we believe that the present invention is novel and inventive over the disclosure of Thompson et al.

Malleshi's work is discussed at page 2 lines 20 - 29 of the present application. Applicant's attorney is advised that he is a co-inventor of the present application even though the order in which his names have been presented (Gurusiddappa Malleshi Nagappa) is different. Since US 2003/0185951 was published less than three months prior to the International filing date of this application, it is not prior art under 35 USC 102(b). To be prior art under 35 USC 102(a) or 102(e) it is necessary that the disclosure be "by another". Since the Malleshi of this reference is an inventor of the present application, US 2003/0185951 is not by another and is not a proper reference. In any case, in US 2003/0185951 Malleshi points out that traditionally millet has been pulverized and the whole meal used for production of edible products because decortication was difficult. His invention is a process for preparation of decorticated finger millet. The present invention builds on this to produce an expanded product from such decorticated grains. Finger millet decortication invariably requires pregelatinization by hydrothermal treatment which has been described in Malleshi. Malleshi comments that with his method, "there exists scope to prepare flaked, popped and other novelty foods from the decorticated millet similar to other cereals such as rice, wheat and maize" (Page 4, Para 61). However, he gives no indication as to how any of this might be accomplished. Paragraph 61 is mere speculation as to what might be done in the future.

The process of the present invention begins with decorticated finger millet or sorghum as produced by Malleshi and provides preparation of expanded millet or sorghum from the decorticated finger millet or sorghum by loosening the endosperm. The decorticated finger millet or sorghum was again tempered, impacted and then subjected to high temperature short time treatment. Therefore the teachings of the present invention go beyond the teachings of Malleshi and actually, provide the preparation of expanded millet or sorghum. A simple sweeping statement without substantiation cannot constitute motivation or guidance.

Nothing in Malleshi or Thompson teaches the use of the steps set out in claim 1 or any of the

other claims of the present application to produce expanded millet or sorghum

Even if the disclosure of Malleshi is read with Thompson et al, one of skill in the art would suffer from the problem as detailed above. It would require further experimentation to develop an expansion process for millet grains. This is because the structure of endosperm of other cereals and that of millet are different. The endosperm of millet is first equilibrated and softened with addition of water and then subjected to mechanical loosening and then dried, graded to nearly similar size and then subjected to heat treatment for a short time. Thompson et al does not teach all these steps. The paragraphs bridging page 4 and page 5 of the specification further detail of the benefits of the process of present invention. From the disclosures of Thompson et al and Malleshi actually it can be verified that methodologies are available in the literature for the expansion of all the grains except finger millet, while retaining its original shape, Even though, several researches have explored popping of finger millet but nobody has mentioned about preparation of expanded millet. The decorticated finger millet contains compact endosperm and hence, direct expansion of the grain by high temperature short time treatment does not lead to a product with good expansion ratio.

Hence it is required that the grain integrity is disturbed with the aid of mechanical impact, still retaining its original shape after expansion. Therefore, we believe that the present invention is novel and inventive over Malleshi read alone or in combination with Thompson et al

Alderman et al - US 2526792 relates to ready-to eat oven-puffed cereal foods having toasted brown color, crispness, friability, and temporary imperviousness to moisture in milk and cream. The cereal grains are "oven puffed" and the method depends on the grain being treated as being a waxy variety of the cereal being used (see column 2 lines 23 - 25). Waxy varieties of sorghum and millet are mentioned as suitable materials to use. Waxy varieties are apparently those wherein the starch is in the form of amylopectin as opposed to amylose. The grains may be processed either as whole grains or after milling, in which case non-waxy elements are then removed before processing. Processing is similar to that of Thompson et al and involves cooking and then oven puffing. Alderman et al teaches puffing the grains either in flake form or in the form of dough to extrude the product which is entirely different from the

methodology followed for finger millet expansion.

It is therefore submitted that the invention as claimed in all claims is novel and nonobvious over Alderman et al read alone or in combination with Thompson et al and Malleshi and that the requirements of 35 USC 103 have been met.

In view of the foregoing, it is submitted that this application is in order for allowance and an early action to this end is respectfully solicited.

Respectfully submitted,



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